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DEVELOPMENT PROGRAM "BISCHOFF PROCEDURE"

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DEVELOPMENT PROGRAM "BISCHOFF PROCEDURE"

[Entwicklungsvorhaben "Bischoff-Verfahren"]

S T E A G

June 19, 1973

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DEVELOPMENT PROGRAM "BISCHOFF PROCEDURE" *

For March, 1973

a) Schedule for the Bischoff installation

The installation was out of operation from March 1-11. In this period, the work detailed under d) was performed.

On March 12, the water circuits were filled and started up at 11:20; flue gas was admitted to the facility at 12:00 noon.

Operating program:
Flue gas throughput: 90,000 m_n^3/h
Nozzle pressures: D1 (replacement for D7) = 4.0 kp/cm^2
D3 - D6 = 2.5 kp/cm^2

Disconnected nozzle 7 (above ring-slot) and started up nozzle 1 (prewasher).

The installation was in full operation from March 12-16. At 6:40 on March 16, compressor imbalance and heating bearings in the compressor forced a shut-down of the installation.

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* 39th progress report for the Labor and Social Ministry of the State NRW**, Düsseldorf, and the State Institute for Immission and Soil Utilization Protection, Essen. March 1973

** Translator's Note: Nordrhein-Westfalen

The installation is out of operation from March 16-20. During this period the compressor problems are eliminated and the subsequent test is prepared. Details of the repair work are given under d).

On March 20, the water circuits are filled and started up at 7:30 on March 21; flue gases are admitted at 7:45.

Operating program:
Test conditions as during previous test, except for a maximum flue gas amount of 140,000 m_n^3/h.

Theinstallation is in full operation between March 21 and March 23.

After concluding the test on March 23, the flue gases are removed from the installation. The water circuits are then turned off and emptied.

The boiler is out of operation from March 24-25.

From March 24-29, conversions for the next test are performed.

On March 29, the installation is again operational. The water circuits are started up at 1:45 PM; at 2:30 PM flue gases are admitted.

Operating program:
Variation in the amount of slaked lime. The main portion of the suspension is sent directly to the ring-slot washer via nozzle 7. The remainder is distributed to nozzles 3-6.
Amount of flue gas: 140,000 m_n^3/h
Δp ring-slot: 100 mm water column
Nozzle pressures: Ring circuit ($D_1 + D_2$): 4.0 kp/cm^2
D3 - D7 : 2.0 kp/cm^2

The installation is fully operational on March 30 and 31.

Test results for March 13-15, 21-23 and 30 - 31

Date	Amount of flue gas $[m_n^3/h]$	Dust contents: Untreated gas $[g/m_n^3]$	Dust contents: Purified gas $[mg/m_n^3]$	Δp ring slot [mm WS]	Nozzle pressure	Dust [%]	SO_2 [%]	Stoichiom. ratio (factor)
13.3.	90.000	9,7	52,3	70	D1 4,0 kp/cm²	99,5	89,7	1,24
14.3.	90.000	10,7	47,2	35	D3 - D6	99,6	91,0	1,28
15.3.	90.000	15,4	56,5	30	≦ 2,5 kp/cm²	99,6	90,1	1,23
21.3.	140.000	14,7	31,0	80	D1 + D3 - D6	99,8	84,4	1,31
22.3.	140.000	12,5	23,5	80	≦ 4,0 kp/cm²	99,8	89,0	1,34
23.3.	140.000	13,2	19,9	85		99,8	87,3	1,30
30.3.	140.000	-	-	100	D3 - D7	-	90,2	0,9
31.3.	140.000	22,2	23,3	100	≦ 2,0 kp/cm²	99,9	81,3	1,26

Comments to the test with disconnected nozzle 7 (above ring-slot), on March 13-15 and 21-23:

The dust contents of the purified gas and the degree of desulfurization are within the so far customary limits. The decreases in the pressure drop in the ring-slot by bypassing nozzle 7 signify a further reduction in the energy requirements with good SO_2 removal.

The dust contents of the purified gas are somewhat lower for

the 140,000 m^3_n/h flue gas throughput than for 90,000 m^3_n/h.

Comments to the test days March 30 and 31, during variation of the amounts of slaked lime:

Since only a few test values are available, no statement is possible at this time. These tests are to be continued during April.

b) Interruption of operations of March 12-16 and 21-23.

March 12	Brief breakdown of the drives (disruption of the power)
March 14	Strong heating of the refurbished bearing of the compressor impeller shaft
March 16	Compressor imbalance removed after flushing with water
March 23	Overheating of the compressor impeller shaft bearing

c) Washer contamination

The summary below shows the contamination of the washer following the tests of March 12-16 after 91 hours of operation, and of March 21-23 after 52 hours of operation, with a basic contamination of 688 hours, i.e., after a total of 779 and 831 hours.
The location of the control sites is indicated on the supplement, "Bischoff installation - Section"

A comparison of the amount of caking determined March 6 with those measured on March 19 and 24 shows the following:

The caking in the cylindrical section in the range of nozzles 3 - 7 has increased again. Measurement results at the nozzle arms 3 and 7 are unchanged. The intermediate valve arms 4 - 6 show strong

Comparison of caking intensity

Control site	Caking intensity	
	after 779 hours on March 19, 1973	after 831 hours on March 24, 1973
1. Gaspipe elbow	no incrustation	loose incrustation
2. Conical transition piece	no incrustation	loose incrustation
3. Cylindrical part from top to bottom to about 2 - 3 m	"	"
at nozzle 3 level	"	1.5 mm "a"
at nozzles 4 & 5	25 mm	31 mm
at nozzles 6 & 7	32 mm	37 mm
4. Components		
Nozzle arm and nozzle 1	no incrustation	no incrustation
Nozzle arm and nozzle 2	taken off	taken off
Nozzle arm 3	20 mm	20 mm
Nozzle 3	light incrustation	light incrustation
Nozzle arm 4	30 mm	35 mm
Nozzle 4	light incrustation	light incrustation
Nozzle arm 5	60 mm	70 mm
Nozzle 5	light incrustation	light incrustation
Nozzle arm 6	35 mm	40 mm
Nozzle 6	light incrustation	light incrustation
Nozzle arm 7	25 mm	25 mm
Nozzle 7	light incrustation	light incrustation
Outside ring-slot	10-12 mm	8-10 mm "b"
Inside ring-slot	20-25 mm	25-30 mm

caking. On the outside of the ring-slot there is a tendency towards a decrease, while an increase in the crusting inside must be noted. Even after 831 hours, the installation can continue operating without removal of the crust.

d) Work on the installation

During the stoppages of March 1-12, 16-20 and 24-29, the following work was performed (for time requirements, see "Schedule for the Bischoff installation March 1973"):

1. Repair of the vane control blading in the compressor. Refurbishing of the shaft bearing on the compressor impeller, followed by rebalancing.
Removal of the damage of February 28 (see February report).

2. Reconnection of the slaked lime dosing pumps onto a common suction pipe to increase the flow velocity in order to prevent sedimentation. Dosing is performed with pump 8, while pump 9 controls circulation.

3. Installation of nozzle 1 and connection to the collector pipe to nozzles 3 - 6. Nozzle 1 replaces the disconnected nozzle 7 during the subsequent tests.

4. Cleaning of the compressor impeller following imbalance.

5. Exchange of the motor on the supplementary pump P10 and completion of the electrical connections.

6. Conversion of the slaked lime dosing station to measure amounts and setting to simultaneously service nozzles 3 - 6 and nozzle 7 with one dosing pump.

Ground water investigation at Lünen disposal site

	Well 1		Well 2		Well 3	
	Jan. 73	Febr. 73	Jan. 73	Febr. 73	Jan. 73	Febr. 73
External:						
Clarity	turbid	very turbid	very clouded	slightly clouded	clouded	very slightly clouded
Color	brown	gray-brown	reddish brown	light gray	reddish brown	pale yellow
Odor	earthlike	slightly earthlike	slightly earthlike	slightly earthlike	slightly earthlike	without
Sediment	grainy brown	- -	reddish brown, fibrous	gray, sandy, flocculent	reddish brown, black fibrous	light gray, sandy
pH value	7,2	7,9	7,3	7,8	7,1	7,3
dissolved solids:						
total (mg/l)	752	928	731	778	940	-
calcination residue (mg/l)	526	-	469	-	568	-
Potassium permanganate consumption, filtered (mg/l)	14	25	16	13	12	14
Biochemical oxygen demand (BOD) in 5 days, filtered(mg/l)	4	6	3	3	3	3
Sulfate (SO_4'') (mg/l)	241	284	197	223	214	221
Sulfite (SO_3'') (mg/l)	< 1	< 1	< 1	< 1	< 1	< 1
Cyanide (CN') (mg/l)	< 0,1	< 0,1	< 0,1	< 0,1	< 0,1	< 0,1

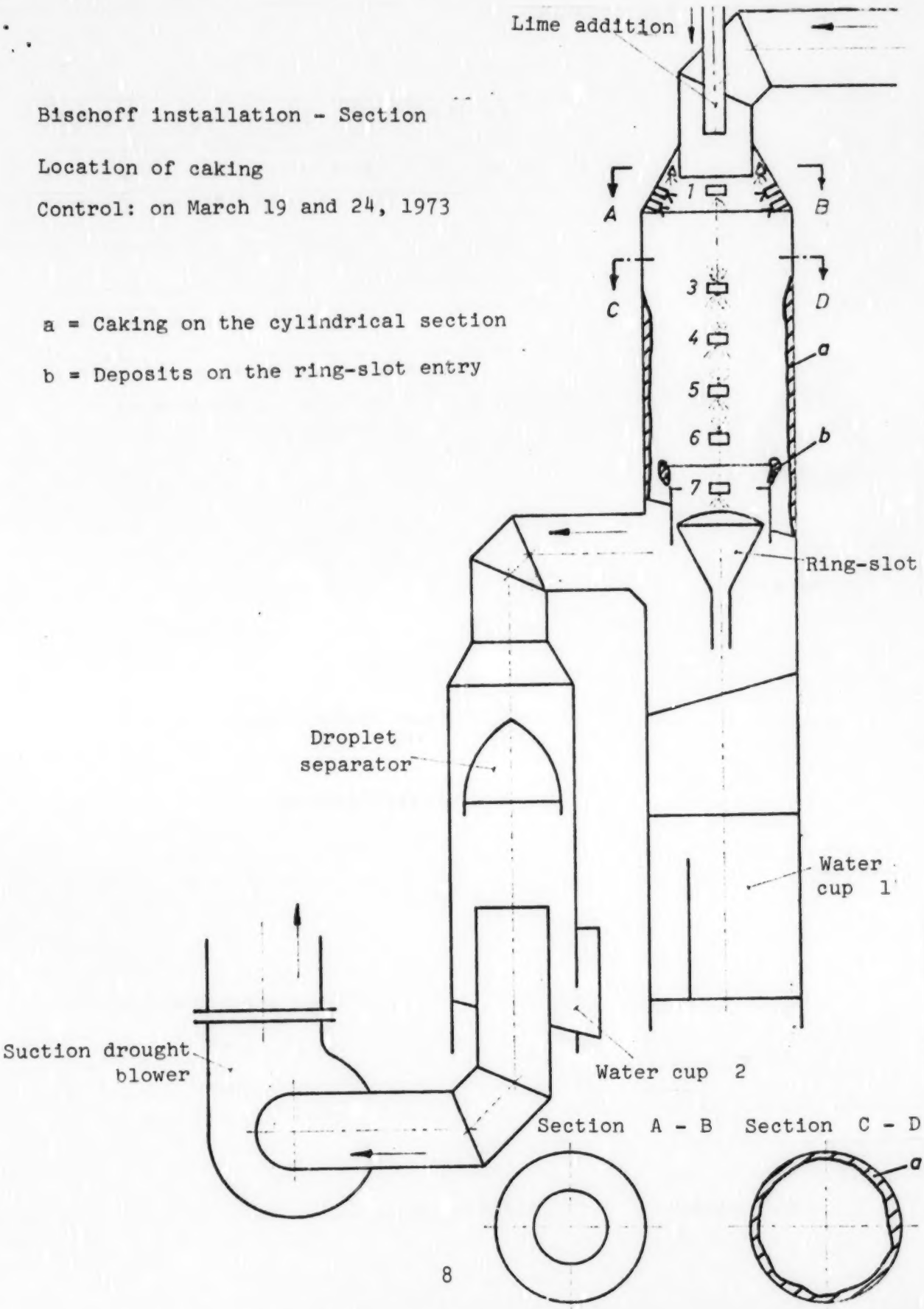
Bischoff installation - Section

Location of caking

Control: on March 19 and 24, 1973

a = Caking on the cylindrical section

b = Deposits on the ring-slot entry



e) Ground water analyses

Appendix 2 contains the analysis values for the ground water samples taken at the control well of the sludge burial site on January 8 and February 2 by the Emschergenossenschaft Lippeverband. The pH values for wells 1 and 2 are slightly higher, as is the dissolved solid content of well 1 in February and well 3 in January. All other values are within current limits.